

## Assessment of Sediment Control Characteristics of Notches in Different Sediment Transport Regimes

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**Abstract :** Landslides during typhoons that generate substantial amounts of sediment and subsequent rainfall can trigger various types of sediment transport regimes, such as debris flows, high-concentration sediment-laden flows, and typical river sediment transport. This study aims to investigate the sediment control characteristics of natural notches within different sediment transport regimes. High-resolution digital terrain models were used to establish the relationship between slope gradients and catchment areas, which were then used to delineate distinct sediment transport regimes and analyze the sediment control characteristics of notches within these regimes. The research results indicate that the catchment areas of Aiyuzi Creek, Hossa Creek, and Chushui Creek in the study region can be clearly categorized into three sediment transport regimes based on the slope-area relationship curves: frequent collapse headwater areas, debris flow zones, and high-concentration sediment-laden flow zones. The threshold for transitioning from the collapse zone to the debris flow zone in the Aiyuzi Creek catchment is lower compared to Hossa Creek and Chushui Creek, suggesting that the active collapse processes in the upper reaches of Aiyuzi Creek continuously supply a significant sediment source, making it more susceptible to subsequent debris flow events. Moreover, the analysis of sediment trapping efficiency at notches within different sediment transport regimes reveals that as the notch constriction ratio increases, the sediment accumulation per unit area also increases. The accumulation thickness per unit area in high-concentration sediment-laden flow zones is greater than in debris flow zones, indicating differences in sediment deposition characteristics among various sediment transport regimes. Regarding sediment control rates at notches, there is a generally positive correlation with the notch constriction ratio. During the 2009 Morakot Typhoon, the substantial sediment supply from slope failures in the upstream catchment led to an oversupplied sediment transport condition in the river channel. Consequently, sediment control rates were more pronounced during medium and small sediment transport events between 2010 and 2015. However, there were no significant differences in sediment control rates among the different sediment transport regimes at notches. Overall, this research provides valuable insights into the sediment control characteristics of notches under various sediment transport conditions, which can aid in the development of improved sediment management strategies in watersheds.

**Keywords :** landslide, debris flow, notch, sediment control, DTM, slope-area relation

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